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Analysing Electronic Govern- ment Websites in Egypt using Content Analysis and Unified Modeling Language

تحليل مواقع الحكومة الإلكترونية في مصر باستخدام تحليل المحتوى ولغة النمذجة الموحدة

Abstract

This research seeks to explore the content of Egyptian governorates websites using content analysis technique. Then, the electronic government (e-government) maturity model is used to provide a deep insight into the content every website, and in order to determine the maturity stage of each governorate website in terms of electronic transactions. After that, each website of the 27 governorates is assigned to a certain maturity level of e-government. The Unified Modeling Language (UML) is then used to analyse each governorate website and visualize the system design. The research then proposes a standardized portal model for all governorates that takes into consideration the active citizens' participation.

After data analysis, it was found that most governorate websites only pass the informative stage of the e-government maturity model. The use of UML has also provided a clear visual view of the current situation of each governorate website, and how the governorate portal should be.

The investigation results promote the construction of a standardized portal that can be used to provide citizens of different governorates a single point of access to their own governorate mission, vision, internal structure, interactive maps, statistical data and financial reports, public authority contacts, governorate news and event calendar.

Keywords: Egypt, e-government, content analysis, maturity levels, standardized portal, UML.

ملخص البحث

يسعى هذا البحث إلى التحقيق في المواقع الإلكترونية للمحافظات المصرية. يستخدم البحث تقنية تحليل المحتوى، ويعتمد على نموذج استحقاق النضج الحكومي الإلكتروني (الحكومة الإلكترونية) لتوفير نظرة عميقة في محتوى وأداء المواقع الإلكترونية بالمحافظات المصرية، ومن أجل تحديد مرحلة النضج لكل محافظة وتعيين كل من السبع و عشرين موقع لكل محافظة إلى مستوى نضج معين من الحكومة الإلكترونية. كما يستخدم البحث لغة النمذجة الموحدة (UML) لتحليل كل موقع إلكتروني من مواقع المحافظات المصرية، وتوفير طريقة قياسية لتصوير تصميم النظام. ويقترح البحث نموذجاً لموقع المحافظة يأخذ بعين الاعتبار مشاركة المواطنين النشطاء.

وبعد تحليل البيانات، تبين أن معظم المواقع الإلكترونية في المحافظات لا تتعدى المرحلة المعلوماتية لنموذج نضج الحكومة الإلكترونية. وقد وفر استخدام UML أيضاً صورة مرئية واضحة للوضع الحالي لكل موقع إلكتروني على مستوى المحافظة، وكيف ينبغي أن يكون شكل البوابة الموحدة لجميع المحافظات. نتائج البحث تعضد من فكرة بناء بوابة موحدة يمكن استخدامها لتزويد المواطنين من مختلف المحافظات بنقطة واحدة للوصول إلى كل ما يهمهم في موقع المحافظة مثل رسالة المحافظة، الرؤية، الهيكل الداخلي، الخرائط التفاعلية، البيانات الإحصائية والتقارير المالية، بيانات التواصل مع السلطة العامة، أخبار المحافظة رزنامة الأحداث للمحافظات

1. Introduction

Governments around the world are moving towards the development of Information and Communication Technology (ICT) in order to speed up the transformation of the public sector, and in an attempt to promote the effective delivery of governmental services and to strengthen the communication channel between the citizens and the government. E-government eliminates inefficient operations and reduces the service delivery obstacles and allows citizens' participation in the decision making process, which leads to greater transparency [1].

The governmental authorities are strongly searching for ways to reform the construction and conduction of more effective and efficient government services [2]. Yet, these attempts still needs enhancements. To help the Egyptian government enhance its online service delivery to citizens, this research explores the content of the 27 Egyptian governorates' websites. Therefore, the current research seeks to answer the following questions:

- Q1:** what is the current situation of the governorate websites?
Q2: which e-government maturity level does each governorate adopts?
Q3: how can the current governorate portal situation be improved?

In order to understand the research problem and answer the above research questions, the current study seeks to assign each governorate website to a certain maturity level of e-government, and propose a prototype for an ideal governorate portal via the following:

- Find the problems facing the governorate websites and their current status.

- Categorize and assign each website to the appropriate e-government maturity level.
- Provide a system Model for governorate portal that can act as a roadmap in order to improve the effectiveness and efficiency of the governorates websites.

2. E-Government

The local government is that part of the whole government of a nation or state which is administrated by authorities subordinate to the state authority. However, the local government is elected independently of control by the state authority, by qualified persons resident, or having property in certain localities, which localities have been formed by communities having common interest and common history [3]. They are controlled by regulations created by the government, they only have a limited level of autonomy in the way they provide services to citizens and the way they manage their administrative process.

E-government can be defined as the adoption of technology, especially the web-based applications to improve the provision of governmental information and services to different parties such as citizens, businesses and government agencies [4]

E-government is considered a necessary way for transforming the provision of the government services to their citizens and other stakeholders anytime and anywhere. Consequently, E-government is not anymore an option but it is a priority for government administrations of developing countries seeking better performance and cost reduction of complex transaction procedures [5].

2.1 Maturity Models of E-Government

E-government implementation is a continuous process, and its development is usually conceptualized in stages [6]. There are various E-government Maturity models that are formed of stages, such as, Layne and Lee's Model, Gartner's Model, United Nation's Model, West's Model, Moon's Model, Asia Pacific Model, Howard's Model and finally World Bank's Model. In the following paragraphs a range of these models will be presented.

According to [7], E-government Maturity is divided into four stages. The first stage is "Cataloging stage", where basic and static information is delivered through accessing online presentations and downloadable forms. The second stage is "Transactional stage", where citizens can perform online transactions through filling simple forms. The third stage is "Vertical Integration stage", in which the government focuses on the automation of government workflows and integrating government functions at different levels. The final stage is "Horizontal Integration stage", where the government focuses on offering users unified and seamless service through systems integration between different levels and functions.

Chandler and Emanuel's [8] Model consists of four stages. The first stage is the Information stage, in which the citizen can access static information through the website. The Interaction stage comes next, where citizens and government interact (two way communication) on simple bases. After the Interaction stages comes the Transaction stage, where financial transactions is enabled between the citizen and the

government such as paying taxes. Finally, the Integration stage is the stage where vertical and horizontal integration of services between different governmental levels take place.

Gartner's Model [9] also consists of Four stages which are Web presence stage where government static information that the citizen can explore, Interaction stage where government support the website with different capabilities as search engines, documents downloading and emails, transaction stage where citizens can perform full online transaction including buying and selling activities, Transformation stage where all governmental processes are integrated.

United Nation's Model [10] consists of five stages. The first stage is the Emerging web presence stage where the website present basic and limited information. The second stage is the Enhanced web presence stage in which dynamic up to date information is provided. The third stage is the Interactive web presence stage where accessibility to search facilities and different forms is enabled. The fourth stage is the Transactional Web Presence stage where two-way interactions between the citizen and the government take place to conduct online transactions. Finally, the seamless/Networked web presence stage is the stage where all services and functions across all government levels are integrated.

West's model [11] consists of four stages. Billboard stage is the stage where the website is used to display information. Second is the Partial service delivery stage where the government begins to offer a set of services online such as sorting and searching of infor-

mation. The Partial service delivery stage is followed by the Full integrated service delivery stage where the citizen is offered a one-stop access to all governmental services, and finally, Interactive democracy with public outreach and accountability stage where citizens can customize the online government information service delivery systems.

Hiller and Blanger's Model [12] consists of five stages. The Information dissemination stage is the first, where the government posts static information through its website. The two-way communication stage is the stage where government offers enhanced website features such as emails and downloadable forms. Third is the Service and financial transaction stage where the website offers online services that include financial transactions. Vertical and horizontal integration stage is the stage where the government systems at different levels vertically and horizontally. The fifth and last stage is the political participation stage where citizens participate in political activities such as Electronic voting. Moon's Model [13] consists of five stages too. They are nearly similar to Hiller and Blanger's Model particularly from stage two to stage five, the difference only in the first step which is the one way communication where information is being disseminated to the citizens.

Asia Pacific's Model [14] consists of six stages. The first stage involves setting up an email system and an internal network, where the government supports the internal process with information systems that support administrative functions such as emails and payroll. The second stage refers to enabling inter-organizational and public access to information stage, where the gover-

mental systems support the work flow management and allow citizens to display governmental information through its website. The third stage is allowing 2-way communication, where two-way interaction between the government and citizens is being enabled. Fourth stage refers to allowing the exchange of value, where citizens are offered advanced online services such as tax assessment, visa application and license renewals. The fifth stage is the digital democracy stage, where citizens are allowed to participate in the democratic process such as online voting. The sixth and the final stage is the joined-up government stage, where vertical and horizontal integration of services occur.

Deloitte and Touche's Model [15] consists of six stages. The Information Publishing stage is the stage where the government builds the website to display static information only. The second is the Official-two way transaction stage, where citizens can submit personal information and conduct financial transactions with single government departments. The Multipurpose portal stage is the stage where government offers a single point access to various governmental services. The fourth stage is the Portal personalization stage, where citizens can customize the governmental portal according to their preferences. Fifth, the Clustering of common services stage where government cluster services along common lines for accelerating the shared services delivery. The last stage is the Full integration and enterprise transaction stage in which the government modifies its structure, and handles the provision of citizens with integrated and personalized services.

Howard's three stages Model [16] consists of three stages, which are publishing stage where basic information about the government services is provided online, interacting stage where citizens can perform simple interactions through the website such as emails, filling and sending forms and the final stage is Transacting stage where citizens can pay for services online.

World Bank's Model [17] consists of three stages, which are publishing stage where all information about the government is posted through the web-

site, interactivity stage where the website is supported with feedback forms and email and the final stage is completing transaction where the citizens can perform online complete and secure transactions.

After reviewing and evaluating these models as shown in table 1, it is being revealed that all of them begin with information provision to the public stage except the Asia Pacific model. After this stage the models begin to differ from each other in a more substitutional way.

Table (1): E-government Maturity Levels

Model	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
Layne andLee [7]	Cataloging	Transactional	Vertical integration	Horizontal integration		
Chandlerand Emanuel [8]	Information	Interaction	Transaction	Integration		
Gartner [9]	Web presence	Interaction	Transaction	Transformation		
United nation [10]	Emerging web presence	Enhanced web presence	Interactive web presence	Transactional web presence	Seamless/ Networked web presence	
West [11]	Billboard	Partial service delivery	Full integrated service delivery	Interactive democracy with public outreach and accountability		
Hiller and-Blanger [12]	Information dissemination	Two-way communication	Service and financial transaction	Vertical and horizontal integration	Political participation	
Moon [13]	One way communication	Two-way communication	transformation	Vertical and horizontal integration	Political participation.	
Asia Pacific [14]	Setting up an email system and internal network.	Enabling inter-organizational and public access to information	Allowing 2-way communication	Allowing exchange of value	Digital democracy	Joined-up government
Deloitte andTouche [15]	Information publishing	Official-two way transaction	Multipurpose portal	Portal personalization	Clustering of common services	Full integration and enterprise transaction
Howard [16]	Publishing	Interacting	Transacting			
Word Bank [17]	Publishing	Interactivity	Completing transaction			

Source: Prepared by the researchers

2.2 Assessment Techniques

There are various assessment techniques that consist of different items such as E-S-Qual, E-RecS-Qual, and EGOSQ. Firstly, the E-S-Qual which is constructed from 22 items distributed on four dimensions including efficiency, fulfillment, system availability and privacy, they are used to evaluate the ease of use of the website, the implementation of the site's promises, the correct technical functioning of the site, the safety of the site and the protection of customer information. Secondly, the E-RecS-Qual which is constructed from 11 items distributed on three dimensions including responsiveness, compensation and contact [18]. At last, the EGOSQ which is constructed from 7 items including information, interaction, integration, accessibility, emotional engagement, active service recovery, assurance and transference, they are used to evaluate the e-government services according to the accuracy, reliability and usefulness of the information, the easy retrieval of the information, the friendly interaction, the ease of use, the website customization, the website accessibility, the website availability, the website well designed and organized interface and fast navigation, the website active service recovery and assurance [19].

The E-government services delivery program was renamed as "Egyptian Government services development program" where "the Egyptian local government development project" was one of its projects. The Egyptian local government development project was divided into three major projects. The first project was one that focuses on enhancing the service provision in local government premises through automating

citizen services and establishing citizen service centers. Secondly, a project that focuses on developing web portals for the governorates and finally developing citizen relationship management system-s [20].

3. Research Methodology

The purpose of content analysis is the provision of knowledge, new insights from data to their context [21]. the techniques employed for content analysis could be quantitative including coding and counting or qualitative [22]. The process of collecting data was divided into the following stages; analyzing the material by a website analyst, constructing a Check List for the researchers to check and answer. Check List questions (as shown in the appendix) were closed-ended questions, with only two options; either yes or no to measure accessibility, search engine optimization, navigation, public out, privacy, multilingualism, news and updating, general content, specific content, information factor, active participation and Internal business. The check List was selected as a suitable vehicle for the current research; as it is relatively quick and easy to create code and interpret. Then, Check List answers were recorded into a frequency table according to each criterion previously determined, and a statistical analysis was performed. More over a website interpretive analysis was applied on the governorate websites by the web analyst to view the overall performance of the websites and record comments at the end of the Check List form shown in the appendix.

In order to ensure that the portal is operating efficiently; e-governorate websites should be analysed and tested using an object oriented technique. A

modeling language is an artificial language whose purpose is to represent information or knowledge about a domain [23]. The Unified Modeling Language (UML) is a standardized, graphical, general-purpose modeling language maintained by the object management group. The language is structured modularly to allow the selection of only those parts that are of direct interest for a given domain [24]. UML is a semi-formal visual modeling language used by developers to model a system at a desired level of abstraction. It allows developers to step back and look at a system, or a subpart hereof, from a more general point of view. UML is also used to capture and model the specification of a standardized governorate portal. UML has been grown to be the de facto standard for modeling software activities. The UML gives a clear understanding of the system under development through its different standard UML diagrams which are: use case diagram, class diagram, sequence diagram, state chart diagram, activity diagram and co-

ponent diagram. Modeling the system activities leads to the production of good system [25].

3.1 Research Design

A number of e-government models, ranging from three to six stages, all models start with an informational stage and having a number of different intermediate stages end to a final stage. Most Models seem to have in common the four stages of Chandler & Emanuel’s amounting to information provision, interaction, transaction and integration, this model focuses partially on citizen centric and functionality and it gave little technical security consideration at transaction stage. Also it makes an important distinction between facilitating unrestricted two way communication, with technologies like email and discussion boards, and explicit transaction processing whereby citizens carry out a complete transaction via an online interface [26].

The four stages of Chandler and Emanuel’s model shown in table 2.

Table (2): Stages [8]

Stages	Definition
Information stage	Accessing static information through the website it includes site allocating, attractiveness, navigability, content and update frequency.
Interaction stage	Interaction between the citizens and government
Transaction Stage	Enabling financial transactions online
Integration Stage	Vertical and horizontal integration of services between different governmental levels takes place

4. Data Analysis

This section presents data analysis and interpretation of 25 Egyptian governorate websites as Suez and Daqaheleya governorate do not have a website, and therefore has no web presence.

4.1 Governorate websites Analysis

The following is a brief description of the main points found in each governorate; most of the governorate lacks privacy, calendar of important governorate events, web master e-mail, se-

arch engine optimization and functioning probably.

1. **Cairo Governorate:** Cairo is the Capital of Egypt with 8 million populations over total area 1881.04 Km². The website does not pass the WCAG W3C accessibility levels. On the positive side, the website is compatible with all types of browsers, and links for downloading required software to function properly are available. In addition to that, the main menu is visible, well organized, and divided into three main categories; citizens, investment and tourism and it remains in the same area on all pages of the website with a visible navigation path with active links, at any point the citizen can return back to the home page. The website also offers information about different governorate's organization contacts. Through a webmaster email address that is available online, citizens can submit complaints or requests using forms offered online but they cannot contact the elected representatives directly. The website does not include the governorate mission and authority priorities or even a message from the governor; however, it contains detailed information about the authority's internal organization and the services it supports. It also includes privacy and security statements. The website publishes news updates on a daily basis as well as e-procurement and job opening notices. However, it does not offer any transactional services. In general, it is considered an informative website with a working properly overall functionality.
2. **El-Behira Governorate:** This website is compatible with all browsers with a consistent design and organized navigational menu; moreover, it offers updated local news. The governorate mission, message from the authority representative is available with clear structured details about the authority internal organization and the services it offers and information about financial issues.
3. **Alexandria Governorate:** The website loads in an adequate time, it does not pass All the First WCAG W3C accessibility levels, links are available to download softwares required for viewing files or any other online functionality, there is a number of broken links but no HTML errors. It is compatible with different browsers and the website homepage link appears at the first page of the search engine results. However, the website Design is poor and the navigational menu is not well organized but it remains at the same area on all pages. The navigation path is visible on all website pages with an option to return to the homepage. The activated links have different colors from the original one. Advanced search is available but does not appear at the homepage. The public authority contact details are available online and a webmaster e-mail address. There is no privacy and security statement available on the website as well as the website does not offer its content in other languages. The governorate news is published and frequently updated. The website contains details on the authority's internal organization and links to relevant private and public sector web-

- site. The website offers e-procurement services and job openings notices.
4. **El-Sharqia Governorate:** This website loads in an adequate time, but it does not pass all the W3C accessibility levels. The website offers links for the required software to view the website content. It does not contain bad links or HTML errors besides it is compatible with different browsers. This website does not appear in the first page of search engine result. The navigational menu of the website is well organized and clearly structured with a consistency through the pages of the website but without different colors for the activated link. The navigation path is visible with a return to homepage option. The website pages design is consistent and there is no search engine available to search the website. Also, the public authority contact details are not available online and the website lacks privacy and security statements. The website is not offered in other languages and it does not promote any kind of citizen participation.
 5. **Dumyat Governorate:** This website is a disaster. The homepage starts with a welcoming note and a list of Dumyat sectors, where when clicked, the sector links load but there is a problem in the website functionality as it does not render in the correct way.
 6. **Kafer Elsheikh Governorate:** This website navigational menu is not well organized or clearly structured. Moreover, the navigational path is not visible on all pages and there is no return to homepage link, a website site map is available. The website contains a calendar with the governorate important events and updated news feeds.
 7. **Asyout Governorate:** This website is one of the well-structured and consistent designed websites. Its navigational menu is well organized with a consistent structure without coloring the activated links with different color and the navigational path is visible. This website supports the citizen with the public authority contact details and the possibility to contact the elected representatives directly. This website is offered in English version which is consistent with the Arabic one. The website offers geographic information systems maps for the governorate. Finally the website made the policy documents available for the public.
 8. **El-Esma3eleya Governorate:** This website has an acceptable design but does not pass the W3C accessibility levels. It has a consistent interface at all the website pages and a search engine to surf the website internally. The website is offered in English but it is not consistent with the Arabic version. The website offers the policy documents to the public.
 9. **New Valley Governorate:** This website contains unrelated content and features to the governorate; it does not meet any of the navigational requirements except the presence of a site map and a search engine. The website offers the public authority contact details and the possibility to contact the elected representatives directly. On the other hand the website does not offer any e-procurement services or job opening notifications.

10. **Qena Governorate:** This website contains bad links. It is not compatible with Firefox browser. The website meets all the navigational requirements except coloring the activating links with different color. This website does not offer any public authority details to the citizens. The website gives the citizens the opportunity to participate with their opinions in the local issues facing their governorate and offer the policy documents to the public.
11. **GanoobSinaGovernorate:** This website appears in the first page of a search engine results. It does not have a well-organized navigational menu but without coloring the activated link, the navigational path is visible on all pages of the website. The website interface is not consistent at all pages of the website; also the website lacks a site map. The citizens can contact the elected representatives directly through the website. The website offers a link to an English version but it does not work.
12. **Sohag Governorate:** This website appears in the first page of a search engine results, it meets the navigational requirements except for the presence of a site map. It does not provide any public contact details or the ability to contact the elected representatives. The website is not offered in other languages. Also the website does not e-procurement services or job offerings notifications.
13. **El-Fayoum Governorate:** This website navigational menu is not well organized or clearly structured but it remains in the same area on all pages, it contains a site map and search engine. It provides citizens with the public authority contact details and webmaster email. The website lacks e-procurement services and job offering notifications.
14. **Bensuif Governorate:** This is one of the best websites, the website design is consistent and well organized; all the internal pages have the same design in terms of layout and themes, the main menu is clear and well-designed however, the activated links don't have different color than their original one more over the navigation path, return home button doesn't exist.
15. **Port Said Governorate:** This website takes a plenty of time to load. It meets all the navigational requirements except for coloring the activated links with a different color. This website contains the governorate mission, vision, authority priorities and the detailed structure of the authority's internal organization. This website does not offer any e-procurement services but offers job offering notifications.
16. **MatrouhGovernorate** :This website has an acceptable design but it lacks a visible navigational path, a consistent interface and search engine. It publishes the public authority contact details and it does not offer any e-procurement services or job opening notifications.
17. **Menia Governorate:** This website does not have a well-organized and clearly structured navigational menu, it lacks return to the home page option and the interface of the website pages is not consistent. It does not offer public authority contact details or the elected representative contacts. The website offers job

- opening notifications but does not offer e-procurement services.
18. **Giza Governorate:** This website lacks a well-organized and clearly structured navigational menu; also, it does not contain a site map. The website offers the public authority contact details and the possibility to contact the elected representatives. The website contains a calendar with the important governorate events and it offers e-procurement services.
 19. **Monofeya Governorate:** This website appears in the first page of the search engine result. It meets all the navigational requirements except for coloring the activated links with different color and the return to the homepage option. The website offers the public contact details, e-procurement services and job opening notifications.
 20. **El-Qaioubeya Governorate:** This website does not load in an adequate time. It meets all the navigational requirements except for coloring the activated links with different color and the return to the homepage option. The website offers e-procurement services only.
 21. **Aswan Governorate:** This website first page starts with a flash video to enter the website. This website does not appear in the first page of the search engine result. It meets all the navigational requirements except for the navigational path visibility and return to home page option. The website does not offer the public authority contact details. It is offered in English version which is not consistent with the Arabic version. The website does not offer e-procurement services or job opening notifications. It offers policy documents to the public.
 22. **North Sina Governorate:** This website meets all the navigational requirements except for the availability of the option of return to homepage. The website is offered in an English version which is not consistent with the Arabic version. The website offers e-procurement services but does not offer job opening notifications.
 23. **El Gharebeya Governorate:** This website is not well organized with a very poor design, it is not user friendly and broke all the navigational rules, and it mainly offers links to other relevant public and private sector website with local news and public authority contact details.
 24. **Luxor Governorate:** This website main menu is visible and organized, the navigation path is visible on all pages of the website with active links, but the public authority contact details is not available online, it does not support other languages, the citizens can involve in discussions about local issues.
 25. **Red sea Governorate:** This website is not accessible, as it does not take in consideration people with visual disabilities or hearing impairments. The navigation menu is organized but the activated links do not have different color than their original one. Although, the website gives detailed information about the authority's internal organization and the services offered, it lacks contact details for public authority. This website is offered in five different languages in addition to the original Arabic version. These languages are English, French, German, Italian and

Russian. Unfortunately, these different languages versions are not consistent with the Arabic version. With respect to the Arabic version, it is purely informative without any links except “click her for more”. The second page, which is actually considered the Main page of the website, is divided into three main tabs; Citizens, Investment and Tourism. The Main page also contains unnecessary animation items. Lastly, the website offers e-procurement and job opening notice.

4.2 Governorate and Maturity levels

As maturity clarifies the growth stage of any object from lower to higher stages or phases in a defined process, Governorate maturity refers to the actual level of progress made by a governorate according to the sophistication of the features present on its website.

This paper is being guided by Chandler and Emanuel e-government maturity model where the implementation of e-government is divided into four stages [8] as follows:

- Information stage includes delivery of government services online and one way communication between government and citizens.
- Interaction stage includes simple interaction between citizens and governments.
- Transaction stage includes services that enable transactions of value between citizens and government
- Integration stage includes integration of services across the agencies and departments of government.

According to Chandler and Emanuel's Maturity Model All Governorates

are at the First stage which is Information stage where citizens can access static information through the website except for the following governorates Asyout, Qena, GanobSina, Benisuif, Portsaid, Minia, Giza, Elqaioubeya, Aswan, NorthSina, Luxor are at the second stage which is interaction stage where citizens and government interact on simple bases.

5. System Modeling

System modelling refers to the interdisciplinary study of the use of models to conceptualize and construct systems in business and IT development. UML is a graphical language for visualizing, specifying, constructing, and documenting the architecture of a software system. UML supports the researcher with standardized tools to document the system analysis and design as well as it contains diagrams that allow people to visualize the components of an object-oriented system.

UML has two main diagrams types' structural diagrams and behavioral diagrams. Structural diagrams are used to describe the relationships between different objects including class diagram, on the other hand behavioral diagrams are used to describe the interactions between the system actors and system itself, and it includes use case diagrams, sequence diagrams, collaboration diagrams, state chart diagrams and activity diagrams.

5.1 Use Case Diagram

This part gives an overall description of the governorate portal, describing the use cases. A use case represents a sequence of actions that provide a meaningful value to an actor and it is

drawn as a horizontal oval shape. An actor can be a person, organization or external system that plays a role in one or more interactions with the system.

A use case diagram focuses on what a system does without describing how the system does it. Also it supports the researcher with a view of what the system users want, it does not include any technical or implementation details [26].

In figure 1 a use case diagram for the e-governorate portal is developed. The portal is used to provide the citizens of different governorate one point of access to his own governorate mission, vision, internal structure, interac-

tive maps, statistical data and financial reports, public authority contacts, governorate news and event calendar.

The portal allows the citizen to register to have the chance to search for job vacancies and apply for it at the governorate; the citizen also can check his electricity and telephone bills.

The portal promotes democracy as the citizen can participate with his opinions at different e-forum topics related his governorate and finally the citizen can send his feedback or complain to the authority representatives.

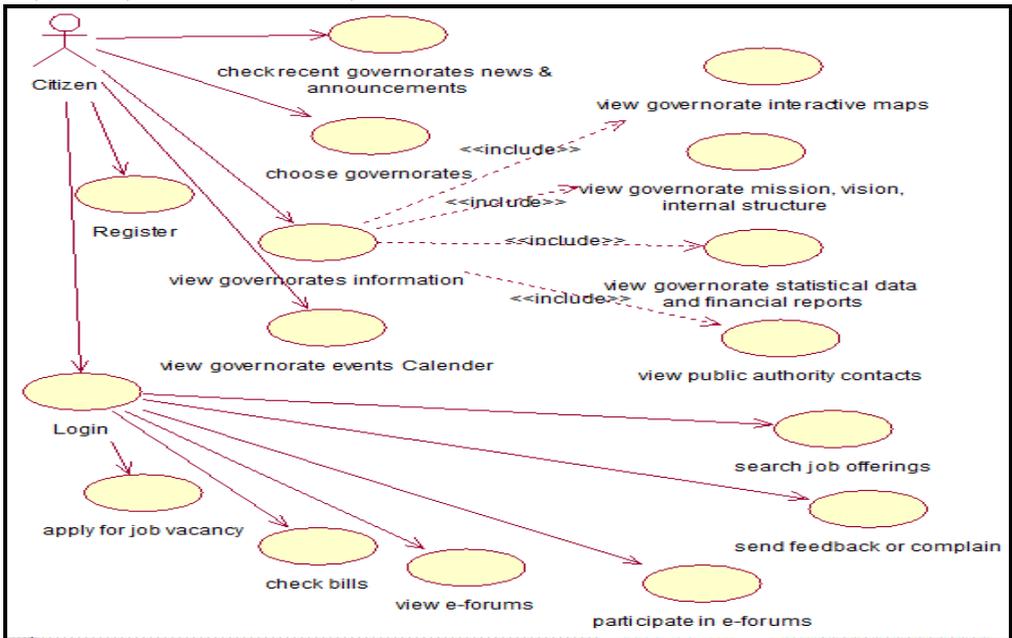


Figure (1): E-governorate Portal Use Case Diagram

Source: developed by the researchers

5.2 User Case Statement

This part illustrates a detailed description of each use case its name, primary actor, description, trigger, pre-co-

ndition, post condition, success scenario and abort scenario as shown in table 3 and table 4.

Table (3): Use Case Statement

Use Case Number	Name	Actor
1	Check recent governorates news and announcement	Citizen
2	Choose governorate	Citizen
3	View governorate information	Citizen
3.1	View governorate interactive maps	Citizen
3.2	View governorate mission, vision, internal structure.	Citizen
3.3	View governorate statistical data, financial reports	Citizen
3.4	View public authority contact	Citizen
4	Check governorate news	Citizen
5	View governorate events calendar	Citizen
6	Register	Citizen
7	Login	Citizen
8	Search job offerings	Citizen
9	Apply for job vacancy	Citizen
10	Check bills	Citizen
11	View e-forums	Citizen
12	Participate in e-forums	Citizen
13	Send feedback or complain	Citizen

Table (4): Use Cases

UseCase Number	1
UseCase Name	Check recent governorates news and announcement
Primary Actor	Citizen
Description	The citizen opens the home page of the governorate portal that includes different governorates news and announcements.
Trigger	The citizen wants to surf the homepage.
Pre_Condition	None
Post_Condition	None
Success Scenario	The citizen will check the latest news and announcements
Abort Scenario	The citizen will leave the portal.
UseCase Number	2
UseCase Name	Choose governorate
Primary Actor	Citizen
Description	The citizen selects a governorate to view.
Trigger	The citizen wants to enter his own governorate.
Pre_Condition	None
Post_Condition	None
Success Scenario	The citizen will view his own governorate page.
Abort Scenario	The citizen will return back to the homepage
UseCase Number	3
UseCase Name	View governorate information
Primary Actor	Citizen
Description	The citizen navigates the governorate general information.
Trigger	The citizen wants to gain general knowledge about the governorate.
Pre_Condition	The citizen should select a governorate
Post_Condition	None
Success Scenario	The citizen will be able to view learn about the governorate.
Abort Scenario	The Citizen leaves the portal.
UseCase Number	3.1
UseCase Name	View governorate interactive maps

Primary Actor	Citizen
Description	The Citizen navigates the governorate map and learns about the main authority buildings location and touristic places.
Trigger	The citizen wants to reach a certain destination.
Pre_Condition	The citizen should select a governorate.
Post_Condition	None
Success Scenario	The citizen will be able to get an accurate address for the required destination.
Abort Scenario	The citizen will leave the portal.
UseCase Number	3.2
UseCase Name	View governorate mission, vision, internal structure.
Primary Actor	Citizen
Description	The citizen displays the governorate mission, vision and the internal structure of the governorate authority.
Trigger	The citizen wants to learn more about his own governorate.
Pre_Condition	The citizen should choose a governorate.
Post_Condition	None
Success Scenario	The citizen will be able to explore the governorate mission, vision and the governorate internal structure.
Abort Scenario	The citizen will leave the portal.
UseCase Number	3.3
UseCase Name	View governorate statistical data, financial reports
Primary Actor	Citizen
Description	The citizen explores the governorate population, statistical data and financial reports for the year.
Trigger	The citizen wants to check the financial reports and statistical data of his own governorate.
Pre_Condition	The citizen chooses a governorate.
Post_Condition	None
Success Scenario	The citizen will be able to view the governorate financial reports and statistical data.
Abort Scenario	The citizen will leave the portal.
UseCase Number	3.4
UseCase Name	View public authority contact
Primary Actor	Citizen
Description	The citizen displays different ways of contacting the public authority.
Trigger	The citizen wants to contact a public authority representative.
Pre_Condition	The citizen chooses a governorate.
Post_Condition	None
Success Scenario	The citizen will be able to find the required contact details.
Abort Scenario	The citizen will leave the portal.
UseCase Number	4
UseCase Name	Check governorate news
Primary Actor	Citizen
Description	The citizen views the different governorate news.
Trigger	The citizen wants to be updates to the governorate news.
Pre_Condition	The citizen chooses a governorate.
Post_Condition	none

Success Scenario	The citizen will know the governorate recent news.
Abort Scenario	The citizen will leave the portal.
UseCase Number	5
UseCase Name	View governorate events calendar
Primary Actor	Citizen
Description	The citizen checks the important events that will take place during the month at his own governorate.
Trigger	The citizen want to view the events calendar
Pre_Condition	The citizen chooses a governorate.
Post_Condition	none
Success Scenario	The citizen will know the important governorate events dates and description.
Abort Scenario	The citizen will leave the portal
UseCase Number	6
UseCase Name	register
Primary Actor	Citizen
Description	The citizen registers to the portal by giving his essential personal information.
Trigger	The citizen wants to register in order to view and apply for job vacancies, participate in e-forums and send his feedback or complain.
Pre_Condition	none
Post_Condition	none
Success Scenario	The citizen will be able to use the portal offered services.
Abort Scenario	The citizen will not be able to participate in the portal activities
UseCase Number	7
UseCase Name	login
Primary Actor	Citizen
Description	The citizen login by entering his social security number and password.
Trigger	The citizen wants to use the portal services.
Pre_Condition	He should be a registered citizen
Post_Condition	none
Success Scenario	The citizen will be able to use the portal offered services.
Abort Scenario	The citizen will not be able to participate in the portal activities
UseCase Number	8
UseCase Name	Search job offerings
Primary Actor	Citizen
Description	The citizen search for a suitable job offering at his own governorate.
Trigger	The citizen wants to find a job vacancy.
Pre_Condition	He should be a registered citizen.
Post_Condition	none
Success Scenario	The citizen will find a suitable job to apply for.
Abort Scenario	The citizen will not find available jobs.
UseCase Number	9
UseCase Name	Apply for job vacancy
Primary Actor	Citizen
Description	The citizen applies for the job by submitting his CV.

Trigger	The citizen wants to apply for the job.
Pre_Condition	He should choose a job.
Post_Condition	none
Success Scenario	The citizen will apply for the job successfully.
Abort Scenario	The citizen will leave the portal.
UseCase Number	10
UseCase Name	Check bills
Primary Actor	Citizen
Description	The citizen checks for his electricity and telephone bills.
Trigger	The citizen want to view his bills
Pre_Condition	He should be a registered citizen
Post_Condition	None
Success Scenario	The citizen will be able to know the value of his bills.
Abort Scenario	The citizen will leave the portal
UseCase Number	11
UseCase Name	View e-forums
Primary Actor	Citizen
Description	The citizen views different e-forums topics and select one.
Trigger	The citizen wants to participate in an e-forum topic.
Pre_Condition	He should be a registered citizen.
Post_Condition	none
Success Scenario	The citizen will select an e-forum topic.
Abort Scenario	The citizen will leave the portal.
UseCase Number	12
UseCase Name	Participate in e-forums
Primary Actor	Citizen
Description	The citizen participates in the e-forum with his different opinions.
Trigger	The citizen wants to share his opinion with other citizens.
Pre_Condition	The citizen should select an e-forum topic.
Post_Condition	None
Success Scenario	The citizen will share his own opinions freely.
Abort Scenario	The citizen will leave the portal
UseCase Number	13
UseCase Name	Send feedback or complain
Primary Actor	Citizen
Description	The citizen sends his feedback or complains through a form to be put in consideration by the governorate.
Trigger	The citizen wants to send his own complain or feedback to the public authority.
Pre_Condition	He should be a registered citizen.
Post_Condition	None
Success Scenario	The citizen will submit his feedback or complain successfully.
Abort Scenario	The citizen will leave the portal.

5.3 Class Diagram

The class diagram represents the static design of the e-governorate portal; it consists of classes and me-

thods and their mutual relationships but it does not represent any particular processing. Classes are modeled as a rectangle in the class diagram; the rectangle

includes the class name, attributes and methods. Attributes are the characteristics of the objects and methods are the code that works with the attributes [26].

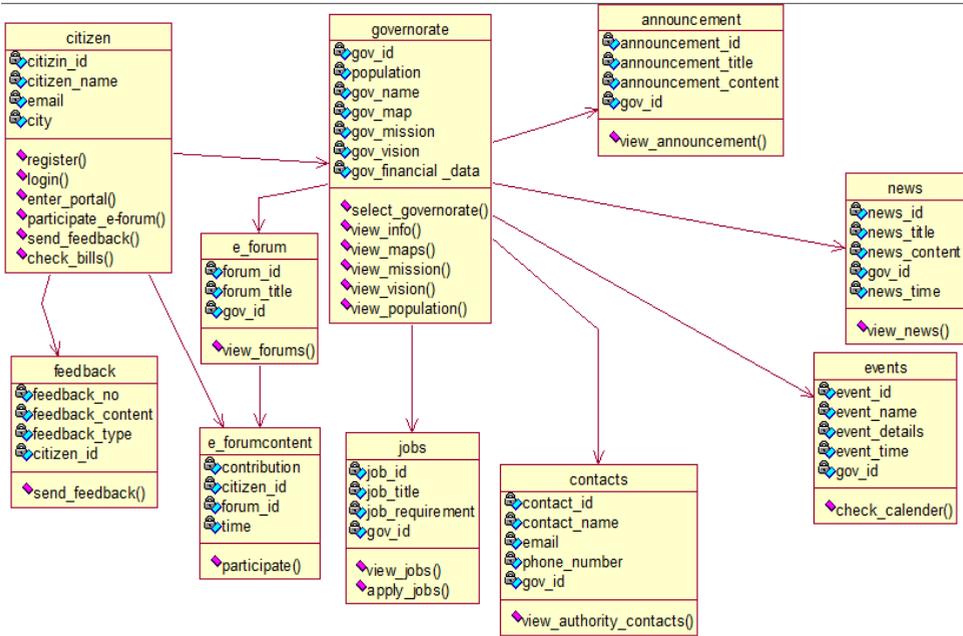


Figure (2): E-governorate Portal Class Diagram

5.4 Class Responsibilities and Collaborators (CRC)

The CRC is being used to document the essential properties of each class and represent the responsibilities of classes and interaction between classes in the E-governorate portal shown in figure 2. They are represented at the following table 5:

Table (5): CRC

Citizen	
Responsibilities	Collaborators
<ul style="list-style-type: none"> • Citizen select a governorate to view its different details including the governorate announcements, news, important events, public authority contacts, job vacancies available and the governorate mission, vision and financial data. • Citizen sign up to the governorate portal. • Citizen search for a suitable job vacancy and apply for it. • Citizen selects an e-forum topic and contributes to it by his own opinions. • Citizen sends his feedback or his complain. 	governorate
	e-forum content
	feedback
Governorate	
Responsibilities	Collaborators
Through the governorate the citizen can retrieve all the information he wants including announcements, news, events, authority contacts, jobs and E-forum topics.	citizen
	announcement
	news
	events
	contacts
	jobs
E-forum	
Announcement	
Responsibilities	Collaborators
<ul style="list-style-type: none"> • The citizen can view specific governorate announcements. 	governorate
News	
Responsibilities	Collaborators
<ul style="list-style-type: none"> • The citizen can view specific governorate news. 	governorate
Events	
Responsibilities	Collaborators
<ul style="list-style-type: none"> • The citizen can view specific governorate events. 	governorate
Contacts	
Responsibilities	Collaborators
<ul style="list-style-type: none"> • The citizen can view specific governorate authority contacts. 	governorate

Jobs	
Responsibilities	Collaborators
<ul style="list-style-type: none"> The citizen can view the job vacancies of a specific governorate and apply for it. 	governorate
E-Forum	
Responsibilities	Collaborators
<ul style="list-style-type: none"> The citizen can view E-forum topic of a specific governorate. 	governorate
Feedback	
Responsibilities	Collaborators
<ul style="list-style-type: none"> The citizen can send his feedback or complain to the concerned authority representative 	citizen
E-Forum Content	
Responsibilities	Collaborators
<ul style="list-style-type: none"> The citizen can participant with his own opinion and contribution in a specific topic. 	Citizen

5.5 Activity Diagram

The activity Diagram is being used to display the activities sequence. It's the workflow from the start point to the finish point entailing the many decision paths that exist in the progression of

events contained in the activity. A rectangle with rounded ends represents an activity, an arrow represents an event, a diamond represents either a decision or a merge, and finally decisions have one arrow going into the diamond and several going out [26].

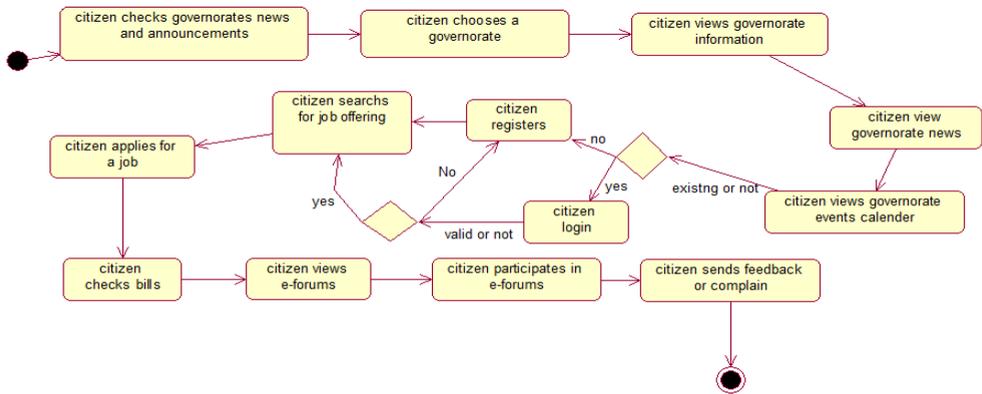


Figure (3): E-governorate Portal Activity Diagram

In figure 3 an activity diagram for the E-governorate portal is illustrated where the citizen checks the general governorates news and announcement, he chooses governorate to view its information. The citizen views the governorate news or the governorate events calendar. If the citizen is not an existing one he must register first if not he must login to start searching a job offering and apply for it or to view the gover-

norate e-forum and participate in it and finally the citizen sends his feedback or complain.

5.6 State Chart Diagram

The state Chart diagram is being used to model the behavior of a single object with specifying the sequence of events an object goes through during its lifetime in response to events [26].

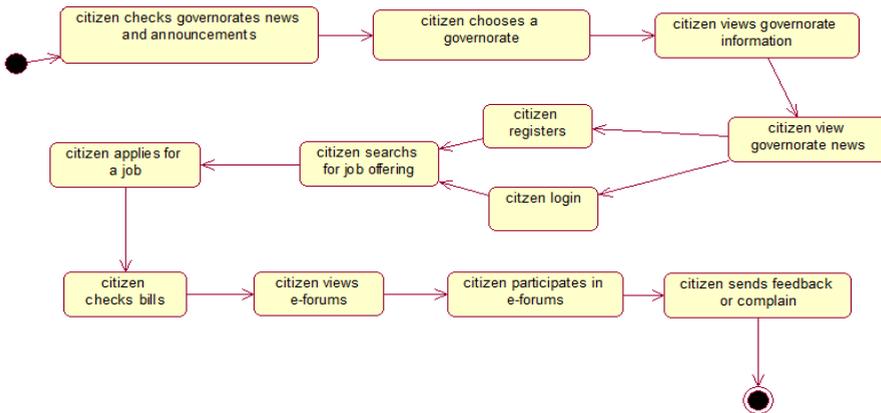


Figure (4): E-governorate Portal State Chart Diagram

In figure 4 the citizen checks the general governorates news and announcement, he chooses governorate to view its information. The citizen views the governorate news or the governorate events calendar. If the citizen login to start searching a job offering and apply for it then he views the governorate e-forum topics and participate in one of it and finally the citizen sends his feedback or complain.

5.7 Sequence Diagram

In a sequence Diagram the interaction between, among others, instances of classes is described, the sequence

diagram consists of a list of participants, the participants are usually arranged in chronological order of activation, messages sent to and received from participants are denoted by arrows and arranged along the vertical axis according to the time sent or received, messages represent the operations of the participants. Sequence diagram is used to show the processing illustrated in use case diagram, In conclusion sequence diagram is used to represent the overall sequence of the activities or interactions in a use case [26].

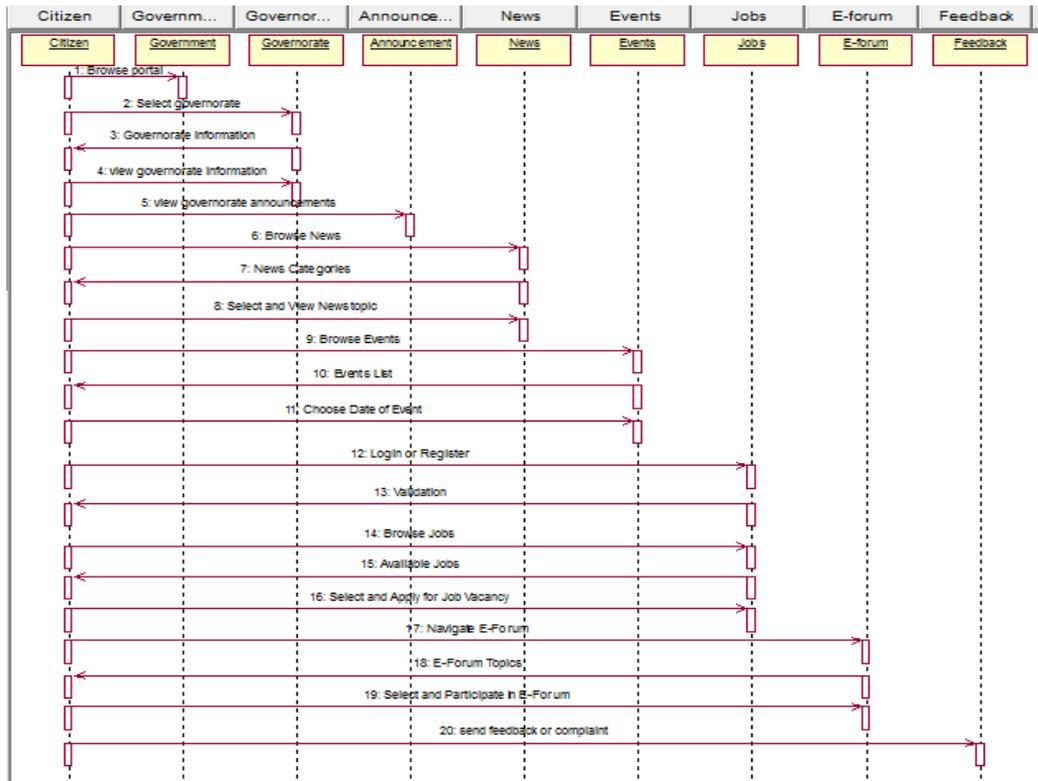


Figure (5): E-governorate Portal Sequence Diagram

In Figure 5 a sequence Diagram is being constructed for the Governorate Portal which consists of nine partici-

pants Citizen, Government, Governorate, Announcement, Events, Jobs, E-forum and Feedback respectively. First,

the citizen browses the portal homepage to take a general feedback about different governorate news, announcements and important events. Then, he selects his own governorate to view its information, secondly he starts viewing the recent news page and by choosing a news category, he can select and view a specific news topic. The citizen can also browse governorate events through choosing a specific date. After that, the citizen can login to the portal. On successful authentication, the citizen can search for available jobs and apply for the suitable one or he can navigate the different E-forum topics and participate at one and finally the citizen can send his feedback or complain.

5.8 Collaboration Diagram

The collaboration diagram focuses on the structural organization of sending and receiving objects, it is not only used to model system functionality, it is also used to model the control flow within a system, the collaboration diagram consists of the structure of objects that collaborate to achieve the specified function and the relationships amongst them. The collaboration diagram consists of three parts objects, collaboration links and the messages passing through those links. Although collaboration diagram shows same information as sequence diagram but they differ at their focus as the collaboration diagram emphasizes the organization of objects and on the other hand the sequence diagram emphasizes the time ordering of messages [26].

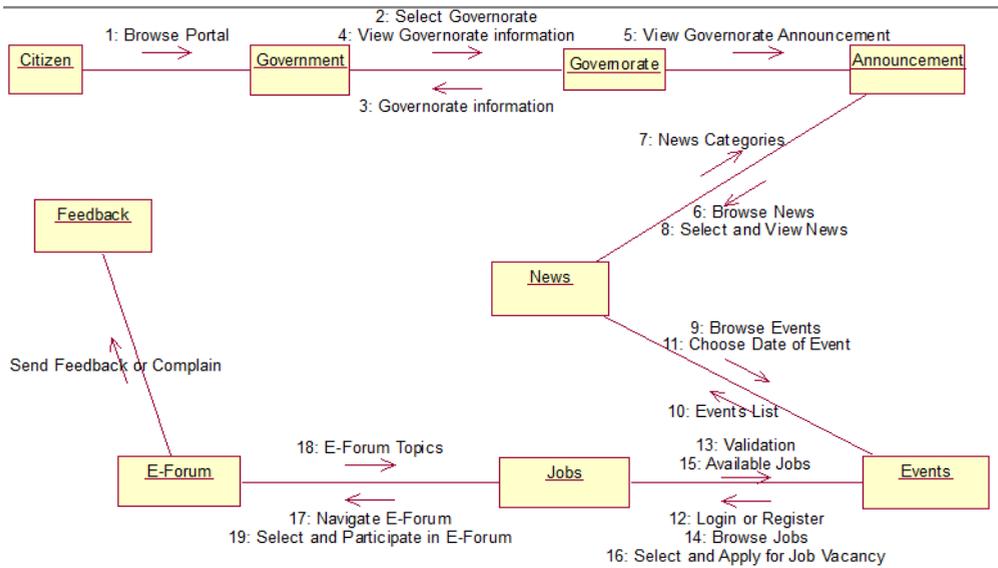


Figure (5): E-governorate Portal Collaboration Diagram

In Figure 6 a Collaboration diagram begins to browse the governorate portal is being constructed where the citizen then he selects a specific governorate

through which he can view governorate announcements, news, events, authority contacts, jobs and E-forum topics and finally the citizen can send and share his feedback with the responsible authority.

6. Conclusion

After analyzing the Egyptian governorate websites content, websites were classified at different maturity levels due to the lack of standardization. To elaborate, each website was found to have a different design, navigational structure, online services and provision of information. Governorate services are simply not integrated. Although the interaction of citizens usually involves visiting the governorate premises, yet, the government does not pay enough attention to the importance of the governorate websites. Analysing 85,057 total votes of Egyptian e-government portal visitors about their experience with the governorates' websites, only 34% were found to be pleased with the governorate services, 20% are displeased with the governorate services, 36% are not aware with the governorates' websites existence at all, and even 10% that are aware of the governorate websites presence, have never used them.

The current maturity level of each governorate website was also evaluated in this paper. Results reveal that most of the governorate websites are in the first maturity level; the Information stage where citizens can access static information through the website, and few are in the second maturity level; the interaction stage where citizens and government interact on simple bases.

Finally, this study proposes the construction of a portal that standardize the delivery of the governorate services using a system modeling approach to visualize the components of the portal. The proposed portal should be developed in a way that can be used to provide the citizens of different governorates one single point of access to the governorate mission, vision, internal structure, interactive maps, statistical data and financial reports, public authority contacts, governorate news and event calendar. The portal also promotes interactivity through allowing citizens to register in order to have the chance to search for job vacancies and apply for it at the governorate. The citizen also can check his electricity and telephone bills. The portal also put democracy into the right track as the citizen participate with his opinions at different e-forum topics related his governorate. Finally, the citizen can sends his feedback or complain to the authority representatives.

7. Research Limitation and Future Work

This paper is subject to some limitations as it is the case with almost all researches. It did not take into consideration the citizens' acceptance of the governorate portal idea and how would they perceive its presence and if they will be willing to use it and contribute in this new experience. In addition, although this study presents a suggested e-government portal model for developers, it did not develop one for testing. Additional factors could be worth identifying and analysis using the proposed model; due to the dynamic nature of the technology environment. A longitudinal approach could also be adopted throu-

ghout a number of time periods, as location-based mobile services evolve in the Egyptian market.

Adding a new evaluation perspective that takes into consideration the back end procedures could also be worthwhile. Developing and testing the validity of the proposed governorate portal may yield different results, and should also be studied in future. Finally, applying this study on a variety of contexts may help find similarities and differences between nations.

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Appendix: Content Analysis Check List

• Accessibility

1. Time required to load the website using 56.6 KB connection(Stage 1)
2. Does the website pass successfully the first WCAG W3C accessibility level? (Stage 1)
3. In case that specific software is required either for viewing files or any other online functionality, does the website provide a link for downloading this software?(Stage 1)
4. Number of bad links present (link check) (Stage 1)
5. Average number of errors on 5 pages (HTML check)
6. Is it compatible with different browsers? (Stage 1)
7. Average number of words spelt incorrectly on pages (spell check) (Stage 1)

• Search engine optimization

1. On which page does the website first appear after a search(Stage 1)
2. The average number of results shown by search engines (link popularity)(Stage 1)

• Navigation

1. Is the navigation menu well organized and clearly structured? (Stage 1)
2. Does the navigation menu remain at the same area on all pages of the website?(Stage 1)
3. Is the navigation path visible on all pages of the website? (Without active links or with)?(Stage 1)
4. Is the option “return to the homepage” available on all pages of the website?(Stage 1)
5. Do the activated links have different color than their original one? (Stage 1)

6. Is the interface (coloring, fonts, etc) the same at all pages of the website? (Stage 1)

7. Is there a site map available or an A-Z index available on the website? (Stage 1)

8. Is there a search engine available through the website? (Stage 1)

• Public outreach

1. Are the public authority contact details available online?(Stage 2)
2. Is the webmaster e-mail address available online?(Stage 2)
3. Is it possible for citizens to contact the elected representatives directly?(Stage 2)

• Privacy

1. Is a privacy and security statement available on the website?(Stage 1)
2. If citizen personal data is requested at any part on the website, is it transmitted over secure connection? (Stage 2)
3. If yes, is information on the usage of these personal data available online?

• Multilingualism

1. Does the website offer its content in other languages besides Arabic? (Stage 1)
2. For each other language, how much content is offered?(Stage 1)
3. Is there consistency between the website and those offered in other languages?(Stage 1)

• News and updating

1. How often is local/regional news published and updated online? (Stage 1)
2. Is a calendar with important events available online?(Stage 1)

• General Content

1. Does the website include details about the governorate mission, authori-

ty priorities, and/or a message from the authority's representative?

(Stage 1)

2. Does the website contain details on the authority's internal organization and the services it offers? (Stage 1)
 3. Are Geographic Information Systems maps available on the website? (Stage 1)
 4. Are there any links to other relevant websites (private and public sector) available on the website? (Stage 1)
- **Specific content**
 1. Are e-procurement services available on the website? (Stage 2)
 2. Are notices for job openings within the Public Authorities published on the website? (Stage 2)
 3. Is information on financial issues (i.e PA budget) available on the website?(Stage 1)

- **E-participation (information factor)**

Are policy documents available on the website?(Stage 1)

- **E-participation (Active participation)**

1. Is it possible for citizens to communicate through: chats, Blogs, eForums, etc? (Stage 2)
2. Can users participate in online polls that involve local/regional interest?
3. If yes, are online polls integrated with the decision making process? (Stage 2)

- **Internal Business**

1. Are the offered services on the website functioning properly? (Stage 3)

- **Web analyst comments in terms of the website's overall performance together with its 'Look and Feel'.**